AMENDMENTS TO THE CLAIMS

1. (original) A method of testing the hearing of a subject, the method comprising the steps of:

(a) creating a test signal having an exponential modulated component;

(b) transducing the test signal to create an acoustic stimulus;

(c) presenting the acoustic stimulus to the subject;

(d) sensing potentials from the subject while substantially simultaneously presenting the acoustic stimulus to the subject; and

(e) analyzing the potentials to determine whether the potentials comprise data indicative of the presence of at least one steady-state response to the acoustic stimulus.

2. (original) The method of claim 1, wherein the test signal comprises at least one of an amplitude component and a frequency component, the at least one of the amplitude component and the frequency component being exponentially modulated.

3. (previously presented) The method of claim 1, wherein the test signal comprises transient components.

4. (original) The method of claim 3, wherein the transient components are sufficiently periodic to evoke responses having a degree of overlap.

5. (original) An apparatus for testing the hearing of a subject comprising:

(a) a signal creator adapted to create a test signal with an exponential modulated component;

(b) a transducer electrically coupled to the processor and adapted to transduce the test signal to create an acoustic stimulus and present the acoustic stimulus to the subject;

(c) a sensor adapted to sense potentials from the subject while the acoustic stimulus is substantially simultaneously presented to the subject; and

(d) a processor electrically coupled to the sensor and adapted to receive the potentials and analyze the potentials to determine if the potentials comprise data indicative of at least one response to the acoustic stimulus.

6. (original) The apparatus of claim 5, wherein the test signal comprises at least one of an amplitude component and a frequency component, the at least one of the amplitude component and the frequency component being exponentially modulated.

7. (original) The apparatus of claim 5, wherein the test signal comprises transient components.

8. (original) The apparatus of claim 7, wherein the transient components are sufficiently periodic to evoke responses having a degree of overlap.

9. (original) A method of analyzing potentials to determine whether the potentials comprise data indicative of the presence of at least one steady-state response to an acoustic stimulus, wherein the method comprises the steps of:

(a) presenting an acoustic stimulus to a subject;

(b) sensing potentials from the subject while substantially simultaneously presenting the acoustic stimulus to the subject to obtain a plurality of data points;

(c) transforming the plurality of data points into a second plurality of data points;

(d) biasing the second plurality of data points with an expected phase value to obtain a plurality of biased data points; and,

(e) applying a statistical test to the plurality of biased data points to detect the response.

10. (original) A method of analyzing electroencephalogram (EEG) data to determine whether the data are indicative of the presence of at least one steady-state response to a steady-state evoked potential (SSAEP) stimulus, the method comprising the steps of:

(a) presenting a SSAEP stimulus to a subject;

(b) sensing EEG data from the subject while substantially simultaneously presenting the stimulus to the subject;

(c) forming at least one sweep from the EEG data;

(d) calculating a plurality of Fourier components for the sweep.

(e) biasing the Fourier components with an expected phase value to obtain a plurality of biased components; and

(f) applying a statistical test to the plurality of biased data points to detect the response.

11. (original) The method of claim 10, wherein the step (e) comprises the steps of:

(g) calculating the amplitude (ai) and phase (qI) for the plurality of Fourier components;

(h) biasing the amplitudes (ai) to obtain biased data points (pi) according to the formula:

$$pi = ai*\cos(qI - qe)$$

wherein qe is the expected phase value.

12. (original) The method of claim 10, wherein the step (f) comprises the steps of:

(i) calculating upper confidence limits using a one tailed Student t-test on biased amplitudes which represent noise in the vicinity of Fourier components where the response should occur; and,

(j) comparing biased amplitudes of Fourier components where the response should occur to the upper confidence limits to determine if the biased amplitudes are larger than the upper confidence limits.

13. (original) The method of claim 10, wherein the expected phase value is obtained from a database of normative expected phase values correlated to subject characteristics and stimulus characteristics.

14. (original) The method of claim 10, wherein the expected phase value is obtained from previous testing on the subject.

15. (original) The method of claim 10, wherein the stimulus contains other components for which responses are detected and the expected phase value is obtained from extrapolation of the phase values for the detected responses.

16. (previously presented) A method of objectively testing the hearing of a subject, wherein the method comprises the steps of:

(a) selecting an auditory test from one of a plurality of steady-state evoked response tests, the auditory test to be administered to the subject;

(b) creating a test signal for the auditory test, the test signal comprising at least one component selected to evoke a steady-state response consistent with the auditory test;

(c) transducing the test signal to create a stimulus

(d) presenting the stimulus to the subject;

(e) sensing potentials from the subject while substantially simultaneously presenting the stimulus to the subject; and,

(f) analyzing the potentials to determine whether the potentials comprises data indicative of the presence of an expected stead-state response to the stimulus,

wherein presenting the stimulus to the subject occurs during a plurality of "stimulus-on" intervals during which stimulus waveforms are presented and does not occur during at least one stimulation off interval, the at least one "stimulus-off" interval being between at least two stimulus on intervals.

17. (canceled).

18. (previously presented) The method of claim 16, wherein the stimulus comprises a stimulus above 60 dB sound pressure level (SPL).

19-20. (canceled).

21. (previously presented) The method of claim 16, wherein presenting the stimulus comprising presenting the stimulus at or above 80 dB sound pressure level (SPL) during the stimulus on intervals.

22. (previously presented) The method of claim 16, wherein the "stimulus-on" duration and the "stimulus-off" duration are automatically controlled.

23. (previously presented) The method of claim 16, wherein the "stimulus-on" duration and the "stimulus-off" duration are manually controlled.

24. (previously presented) The method of claim 16, wherein the "stimulus-off" duration corresponds to a subject recovery period.

25 - 26. (canceled).

27. (previously presented) The method of claim 16, wherein the test signal also comprises noise masking.

28. (original) The method of claim 27, wherein the noise masking comprises one of white noise, pink noise, band-pass noise and band-pass spectra noise.

29. (previously presented) A method of objectively testing the hearing of a subject, wherein the method comprises the steps of:

(a) selecting an auditory test to be administered to the subject;

(b) creating a test signal comprising at least one component for the auditory test;

(c) transducing the test signal to create a stimulus

(d) presenting the stimulus to the subject;

(e) sensing a potential from the subject while substantially simultaneously presenting the stimulus to the subject; and,

(f) analyzing the potential to detect a response,

wherein the auditory test comprises a supra-threshold test comprising an intensity limen test and the test signal comprises an amplitude modulated component having a modulation depth of approximately 100%, wherein the intensity limen test comprises the steps of:

(g) performing steady-state evoked potential testing while minimizing the modulation depth of the test signal upon each detected response to determine a minimum modulation depth at which a response is detected; and,

(h) comparing the minimum modulation depth with a database of normative minimum modulation depths to obtain an indication of the status of the auditory system of the subject.

30. (previously presented) The method of claim 29, wherein the supra-threshold test comprises a frequency limen test and the test signal comprises an amplitude modulated component having a frequency modulation depth, wherein, the frequency limen test comprises the steps of:

(i) determining a minimum modulation depth at which a response is detected; and,

(j) comparing the minimum modulation depth with a database of normative minimum modulation depths to obtain an indication of the status of the auditory system of the subject.

31. (previously presented) A method of objectively testing the hearing of a subject, wherein the method comprises the steps of:

(a) selecting an auditory test to be administered to the subject;

(b) creating a test signal comprising a plurality of test signal components for the auditory test;

(c) transducing the test signal to create a stimulus

(d) presenting the stimulus to the subject;

(e) sensing a potential from the subject while substantially simultaneously presenting the stimulus to the subject; and,

(f) analyzing the potential to detect a response,

wherein the auditory test is an auditory threshold test and wherein the auditory threshold test comprises the step of:

(g) individually adjusting the intensity of each test signal component and iteratively carrying out steps (c) to (e) at several intensity levels for each test signal component in order to determine a minimal stimulus intensity for which a response is detected for each test signal component.

32. (previously presented) A method of objectively testing the hearing of a subject, wherein the method comprises the steps of:

(a) selecting an auditory test to be administered to the subject;

(b) creating a test signal comprising at least one component for the auditory test;

(c) transducing the test signal to create a stimulus

(d) presenting the stimulus to the subject;

(e) sensing a potential from the subject while substantially simultaneously presenting the stimulus to the subject; and,

(f) analyzing the potential to detect a response,

wherein the auditory test is an auditory threshold test and the test signal comprises two or more combined amplitude modulation and frequency modulation signals having carrier frequencies which are separated by at least one-half octave, wherein, each combined amplitude modulation and frequency modulation signal has a frequency modulated component and an amplitude modulated component wherein at least the envelope of each

combined amplitude modulation or frequency modulation signal is modulated by an exponential modulation signal.

33. (previously presented) The method of claim 16, wherein the auditory test is conducted for a maximum time limit that is adjusted according to both the intensity which is being tested and an estimate of EEG noise level of the subject.

34. (currently amended) The method of claim 33, wherein the maximum time limit T is adjusted according to $T=S(B/N)^2$, where S is the sweep time, B is the single-sweep noise level, and N is the noise level at criterion.

35. (previously presented) A method of objectively testing the hearing of a subject, wherein the method comprises the steps of:

(a) selecting an auditory test to be administered to the subject;

(b) creating a test signal comprising at least two components for the auditory test;

(c) transducing the test signal to create a stimulus

(d) presenting the stimulus to the subject;

(e) sensing a potential from the subject while substantially simultaneously presenting the stimulus to the subject; and,

(f) analyzing the potential to detect a response,

wherein the components of the test signal are indivdually changed based upon the response and a recording criteria to improve the likelihood of obtaining a response for at least one component of the test signal.

36. (previously presented) The method of claim 35, wherein the recording criteria comprise an amount of noise measured for each of the potentials evoked by different components of the stimulus.

37. (previously presented) The method of claim 35, wherein the component of the test signal is changed automatically, and wherein said analyzing the potential includes analyzing data related to at least one component being presented at a selected intensity level.

38. (canceled)

39. (previously presented) The method of claim 35, wherein the component of the test signal is changed manually, and wherein said analyzing the potential includes analyzing data related to at least one component being presented at a selected intensity level.

40. (previously presented) The method of claim 35, wherein the component is changed by adjusting its amplitude and the recording criteria comprises a particular response from the subject reaching significance at a selected probability level.

41. (original) The method of claim 40, wherein the step of indicating comprises at least one of providing a visual indicator and an audio indicator.

42. (canceled).

43. (canceled).

44. (previously presented) An iterative adaptive staircase method for automatically obtaining frequency specific threshold estimation for one or more acoustic stimuli presented to a subject comprising the steps of:

(a) presenting to the subject at least one acoustic stimulus to evoke at least one steady-state response from the subject while simultaneously recording electroencephalograph (EEG) data from the subject;

(b) statistically assessing the presence of at least one steady-state response in the EEG data;

(c) repeating steps (a) and (b) until a recording criterion is reached;

(d) decreasing the intensity of the at least one acoustic stimulus a specified amount;

(e) repeating steps (a), (b), (c) and (d) for a specified range of intensities;

(f) generating summary results based upon the absence of a steady-state response at one or more intensities, and

(g) indexing data for multiple stimuli presented simultaneously so that partially overlapping portions of the data can be combined according to stimulus component and intensity.

45. (original) The method of claim 44, wherein the recording criterion is a noise level based upon the intensity of the acoustic stimuli.

46. (original) The method of claim 44, wherein the step (d) comprises decreasing the intensity of a component of the at least one acoustic stimulus.

47. (original) The method of claim 44, wherein the step (d) comprises decreasing the intensity of the at least one acoustic stimulus a specified amount if the steady-state response associated with the at least one acoustic stimulus was detected and maintaining the intensity or increasing the intensity of the at least one acoustic stimulus a specified amount if the steady-state response associated with the at least one acoustic stimulus was failed to be detected.

48. (original) The method of claim 44, wherein step (b) comprises:

(g) creating an n by m table where each cell of the table contains an index with values of the sweep numbers for each stimulus at each intensity level; and

(h) detecting a response to each stimulus at each intensity level by averaging data in a particular cell of the table.

49. (previously presented) An iterative adaptive staircase method for obtaining frequency specific threshold estimation for two or more simultaneously presented stimuli comprising the steps of:

(a) presenting at least two acoustic stimuli to a subject, each of which evoke a steady-state response in the subject;

(b) recording electroencephalograph (EEG) data from the subject until a recording criterion is reached;

(c) decreasing the intensity of each of the at least two acoustic stimuli a specified amount;

(d) repeating steps (a), (b) and (c) until a stopping criteria is met;

(e) generating summary results based upon failure to detect a steady-state response at one or more intensities, and

(f) indexing data for multiple stimuli presented simultaneously so that portions of the data can be combined according to stimulus component and intensity.

50. (original) The method of claim 49 wherein step (c) comprises decreasing the intensity of each stimulus for which a corresponding steady-state response has been detected and has fulfilled a recording criteria.

51. (original) The method of claim 49, wherein the recording criteria comprises reaching significance and staying significant for a specified amount of time.

52. (original) The method of claim 49 wherein a recording criterion is selected to be one of: a level of residual background noise; a level of residual background noise proximate to the frequency of at least one steady-state response which is being evaluated; a time limit; an absolute time limit; a time limit based upon normative values for similar stimuli and intensities; and a time limit based upon an estimate of background noise levels estimated from at least part of the total recorded data.

53. (original) The method of claim 49 wherein the recording criterion is based upon the intensity level of the stimulus, and is chosen based upon at least one of: a normative database; previously recorded data of the subject; and a combination of a normative database and previously recorded data of the subject.

54. (original) The method as described in claim 49 wherein step (c) comprises decreasing the intensity of each stimulus which has been detected and has reached a recording criteria or increasing the intensity of a stimulus for which a response has failed to be detected.

55. (previously presented) A method of testing the hearing of a subject, the method comprising the steps of:

(a) creating a periodic test signal, the period being sufficient to evoke responses having a degree of overlap;

(b) transducing the test signal to create an acoustic stimulus;

(c) presenting the acoustic stimulus to the subject;

(d) sensing potentials from the subject while substantially simultaneously presenting the acoustic stimulus to the subject; and

(e) analyzing the potentials to determine whether the potentials comprise data indicative of the presence of at least one steady-state response to the acoustic stimulus,

wherein the test signal comprises a modulated signal having at least one slope steeper than sine wave modulated signal slopes and regions between maxima having less energy than corresponding regions of a sine wave modulated signal.

56. (canceled)

57. (original) The method of claim 55, wherein the test signal comprises transient components.

58. (original) The method of claim 55, wherein the transient components are sufficiently periodic to evoke responses having a degree of overlap.

59. (original) The method of claim 55, wherein the test signal has an "on" duration and an "off" duration.

60. (original) The method of claim 59, wherein the "on" duration and the "off" duration are automatically controlled.

61. (original) The method of claim 59, wherein the "on" duration and the "off" duration are manually controlled.

62. (original) The method of claim 59, wherein the "off" duration corresponds to a subject recovery period.

63-68. (canceled)

69. (currently amended) A method of objectively testing the hearing of a subject, wherein the method comprises the steps of:

(a) selecting an auditory test to be administered to the subject;

(b) creating a test signal for the auditory test, the test signal [[comprising]] comprising a plurality of transient components for the auditory test;

(c) transducing the test signal to create a stimulus

(d) presenting the stimulus to the subject;

(e) sensing a potential from the subject while substantially simultaneously presenting the stimulus to the subject; and,

(f) analyzing the potential to determine whether the potential comprises data indicative of the presence of a response to the stimulus,

wherein said potentials of the subject are stored in data epochs and said transient components occur with a repetition rate that is an integer sub-multiple of the data epochs.

70. (previously presented) The method of claim 69, wherein the transient components comprise at least one of tone-pips and clicks, which have silent intervals set so

that said pips and clicks occur at the said repetition rate that is an integer sub-multiple of the data epochs.

71-84 . (canceled).